WASHINGTON
SCIENCE TRENDS

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* PROJECT BANSHEE

Defense Atomic Support Agency (DASA) and the Army, Navy and Air Force are drawing up plans for unusual high-altitude tests of explosives over the Western United states next Spring. The experiments, designated by the code term "Project Banshee" are expected to provide new information useful for anti-ICBM and anti-satellite programs.

Officials told Washington SCIENCE TRENDS that conventional explosives such as dynamite will be lofted by 300-foot, 5-million cubic foot balloons, probably from the White Sands missile range in New Mexico. The 500-pound package will be detonated at approximately 125,000 feet.

The blast propagation experiments will be elaborately instrumented, on the ground and in the air. Special fail-safe procedures must be taken to insure that the balloon does not stray over populated areas and that the explosive package detonates only on command. DASA officials plan to meet with the Federal Aviation Agency late this month to obtain approval of the tests and to demonstrate safety precautions.

The effects of nuclear explosions in the upper atmosphere have been studied previously in the Teak, Orange and Argus series of tests in the Pacific. Officials said that, if successful, Project Banshee would demonstrate the feasibility of using large balloons for such experiments in addition to providing new information expected to be useful in a number of fields.

* RESEARCH AND DEVELOPMENT TRENDS

Private industry spent some $8.2 billion for research and development during 1958, according to new estimates by the National Science Foundation. This represents a 7 percent increase during a year when business expenditures for plant and equipment were declining by about 17 percent. The figures may also tend to support those who point to R&D as an important factor for the stabilization and growth of the economy.

However, the reported 7 percent increase corresponds almost exactly with an increase in Federal Government support of private industrial research during the year. During 1958 Washington financed $4.6 billion or 56 percent of the $8.2 billion total -- up 7 percent from 1957. And the "increase" was actually at a lower rate than in the preceding five years, partly because of the decline in funds for R&D in the aircraft and parts industry. Significantly, Federal R&D financing for this industry was down by some $83 million during 1957-1958.

(Report available. 6 Pages. 10 Cents. Write Superintendent of Documents, Government Printing Office, Washington 25, D. C. for Pub. NSF 60-35.)

U. S. ARMY FUEL CELL PROGRAMS

Three Technical Services of the U. S. Army are carrying out and supporting fuel cell research, in their own laboratories and under contract with industry and universities. Here is a summary of current programs:

* SIGNAL CORPS

This service is emphasizing the use of fuel cells for auxiliary power for space vehicles, for battery applications, and for small portable units, partly with funds supplied by the Advanced Research Projects Agency (ARPA). Contract programs include:

ø Pratt & Whitney Aircraft, Division of United Aircraft is working on a 500-watt regenerative hydrogen-oxygen fuel cell in which photovoltaic conversion through "solar cells" will be used to electrolyze water. The hydrogen and oxygen so produced will be stored to be combined at a later time when no power is available from the solar source.

ø Missiles and Space Division of Lockheed Aircraft is working on two approaches to a solar regenerative fuel cell. One involves a chemical system in which the reactants, consumed in a fuel cell, yield a product which can be decomposed to give the original reactants. The other is a chemical system which will permit the electrochemical reaction to be reversed by a photochemical process.

ø General Electric Co. is investigating the application of its hydrogen-oxygen cell employing an ion-exchange membrane for the electrolyte. The system would be employed for space applications.

ø Electro-Optical Systems, Inc. was asked to develop and experimentally test concepts for new solar regenerative fuel cells. This includes non-dissociation type cells -- systems which can trap solar energy as in the heat of solution, heat capacity, etc. Other types of fuel cells are also under consideration.

ø Mine Safety Appliance Research Corp. is working on a thermally regenerative fuel cell; one employing lithium hydride has already been constructed. This unit has been operated between 570 and 820° C with an efficiency of 12%. It is expected that these temperature limits may be extended and other losses reduced to increase efficiency to approximately 30%.

ø Signal Research and Development Laboratory, Ft. Monmouth, N. J. is studying a number of concepts. These include regenerative systems using organic materials such as aromatic nitro and nitroso compounds which theoretically have high watt hour per pound capacities; general studies with hydrogen-oxygen fuel cells; systems which employ liquid organic fuels and organic liquids or air as oxidants; and ion-exchange membrane systems for hydrogen-oxygen and other fuel combinations.

*ORDNANCE CORPS

The Ordnance Corps program is aimed at development of a technology which will make fuel cells practical as the prime power source for vehicular propulsion. It is expected that such a system will use standard petroleum-derived fuels at greater efficiency than conventional engines. The vehicles must start quickly, operate anywhere from -65° to + 125° F, with an operating life of at least several months. They must also be capable of intermittent operation and standing on open circuit without damage.

ø Redox Cell studies are being carried out by and for the Army's Diamond Ordnance Fuze Laboratories, Washington, D. C. and by the University of Florida, Pennsylvania State University and, until recently, by the General Electric Co.

ORDNANCE CORPS (Continued)

ø Direct Fuel Electrode Cell system will be studied by the California Research Corp. under a recently initiated contract. The chemical mechanism and kinetics of electrochemical half cells using petroleum-derived fuels as the directly oxidizable material will be investigated.

*CORPS OF ENGINEERS

This service is responsible for development of fuel cells for larger power units such as generators for such special applications as illumination, detection, data processing and weapon checks. Also required are large stationary units which provide power for general military use. Efficiency of fuel utilization is important here, as well as general availability, ease of handling and storage. Contract programs include:

ø Studies by the General Electric Co. toward the use of carbonaceous and other type fuels in an ion-exchange membrane electrolyte system. A reaction was achieved in preliminary experiments, but current densities obtained were small and further work is in progress.

ø Monsanto Chemical Co. is making a feasibility study on low temperature fuel cells using hydrocarbons and related compounds as fuels. Promising results are said to have been obtained with hydrazine and work will be continued on this compound in acid and alkaline media.

ø Curtiss-Wright Corp. is investigating high temperature molten salt systems and is building a 150-watt unit to operate on hydrocarbon gases. The cell electrolyte is a mixture of alkali carbonates; the electrodes are treated stainless steel. Similar work is being carried on under contract with the Central Technical Institute, the Hague, Holland.

(Research programs reported to the Society of Automotive Engineers by S. J. Magram and B. R. Stein, Physical Sciences Division, Army Research Office, Office of the Chief of Research and Development, Washington 25, D. C.)

*FUEL CELL ELECTRODE MATERIAL SOUGHT

The military services are seeking electrode material for fuel cells with a pore size gradient across the thickness of the material. Specifications: The material must be strong enough so that it will be self-supporting when in the form of large disks or circular plaques. The material must have several regions of pore size so that larger pore size regions move gradually to regions of smaller pore size parallel to the plane face of the electrode. This means, when expressed in terms of a cylindrical pore model, funnel shaped pores. The material must have the highest porosity practical in all pore size regions and the pores in one differential region must all be of the same size (diameter).

The military also specifies that the range of pore sizes across the electrode must be in the order of one magnitude as a minimum and three magnitudes as a maximum. In terms of cylindrical models the pores must have parallel cylinders (of different sizes in the different regions) on the same axis fitted together in the manner of an extended telescope. The axes of all pores must be parallel and perpendicular to the plane faces of the material. The plane faces of the material should be parallel.

(For information on how and where to submit proposals subscribers may write Service Department, Washington Science Trends, 1120 National Press Bldg., Washington 4, D. C.)

PUBLICATION CHECKLIST

( ) SCIENCE EDUCATION STATISTICS, a compilation of statistical material on the education and training of scientists and engineers in the United States. Designed for use by those concerned with program administration and policy formulation in scientific and educational matters. 94 pages of tables. 55 cents. (Write Superintendent of Documents, Government Printing Office, Washington 25, D. C. for Pub. NSF 60-13)

( ) ANTITRUST PATENT LICENSING, a thoroughgoing analysis of the policies and procedures of compulsory patent licensing under antitrust judgements. Includes a summarization of all such judgements for the years 1941-1959. 78 Pages. Single Copies Free while available. (Write Committee on the Judiciary, Subcommittee on Patents, U. S. Senate, Washington 25, D. C.)

( ) NUCLEAR ELECTRONICS - FRANCE, a review in French with English summaries of electronic instruments which are, or may be, used in nuclear physics, medicine, agriculture and other areas of the atomic industry. 59 Pages. (Write Documents Service, International Atomic Energy Agency, Vienna I, Austria for Electronic Equipment used in the Nuclear Energy Industry in France)

( ) HIGH ALTITUDE ROCKETS, a Navy bibliography of U. S. and foreign literature on the growth and development of upper-atmosphere study by rockets for the period 1946 through June, 1959. 132 Pages. $2.75. (Write OTS, U. S. Department of Commerce, Washington 25, D. C. for PB 151 805)

( ) HAFNIUM, a Government publication discussing the history, nuclear properties, nuclear and nonnuclear uses, refining, melting, fabrication and shaping and related material pertaining to hafnium and hafnium alloy systems. 384 Pages. $1.50. (Write Superintendent of Documents, Government Printing Office, Washington 25, D. C. for Pub. Y 3.At 7:2 H 11)

( ) TOPOGRAPHIC MAP INDEX, a new index map of the U. S. showing the area covered by each of the Government's small-scale topographic maps. Single Copies Free. (Write Map Information Service, U. S. Geological Survey, Washington 25, D. C.)

( ) RUSSIAN IGY LITERATURE, a U. S. Translation of a Russian bibliography containing the titles of 625 books and articles in the Russian Language for 1958 dealing with various aspects of the International Geophysical Year. 75 Pages. Single Copies Free. (Write National Aeronautics and Space Administration, 1520 H Street, N. W., Washington 25, D. C. ATTN: CODE BID for NASA T.T. F-12)

( ) SCIENCE & TECHNOLOGY PANEL, a transcript of the papers and remarks of a group of scientists and engineers and appointed as advisors to a Congressional Committee. Includes discussions of applied mechanics, future trends in meteorology and other subjects. 73 Pages. Single Copies Free. (Write House Committee on Science and Astronautics, George Washington Inn, Washington, D. C. for House Report No. 1587 -- Serial B)

( ) COMBUSTION HEAT, a publication giving detailed descriptions of apparatus and methods used at the National Bureau of Standards for precise determination of heats of combustion of liquid hydrocarbon fuels. The information gained is used in the calculation of jet or rocket engine performance. 24 Pages. 25 Cents. (Write Superintendent of Documents, Government Printing Office, Washington 25, D. C. for NBS Monograph No. 7)

The Quartermaster General

Subject	Contact
Material-handling equipment, clothing and supplies	Quartermaster Research and Engineering Command (QMR&EC) Quartermaster Research and Engineering Center Natick, Massachusetts Telephone: OLympic 3-1000 Lt. Col. Carl L. Whitney Commanding Officer, QMR&EC, Ext. 646 Major R. E. Bridges Executive Officer, QMR&EC, Ext. 268
Aerial delivery and related equipment	Mr. Harold S. Jones, Ext. 318
Air-conditioning and refrigeration equipment--self-contained units; refrigerators, portable, mobile; warehouses, insulated; liquid chillers; consulting service	Mr. Richard J. Campbell, Ext. 355
Environmental research	Dr. Walter F. Wood, Ext. 548
Flexible armor materials and personnel armor	Mr. M. I. Landsberg, Ext. 517
Foamed plastics, paper and rubber products, adhesives and paints	Dr. J. Alden Murray, Ext. 373
Fungicides and germicides; sanitary chemicals and sanitation processes	Dr. Arthur Kaplan, Ext. 604
Human factors engineering and research	Dr. Ralph Dusek, Ext. 344
Insecticides and rodenticides	Dr. John Pratt, Ext. 269
Material-handling equipment--powered and nonpowered industrial trucks; combination tractor/fork lift/crane for rough terrain handling; straddle trucks; side-loading lift and transport trucks; pallets; gantry cranes; allied attachments for special handling; loading ramps; pneumatic dunnage	Mr. Harry S. Wilson, Ext. 456
Personnel cooling and heating	Mr. Leo Spano, Ext. 471
Personnel cooling, decontamination and oversnow equipment	Mr. Paul E. Whittington, Ext. 450
Petroleum-handling equipment--cans, drums, tanks, dispensing pumps, and allied equipment	Mr. Dwight F. Hastings, Ext. 203
Protective clothing for handlers of rocket fuels and oxidizers	Mr. Ted Bailey, Ext. 636 or 266

The Quartermaster General (Continued)

Subject	Contact
Rubber	Dr. Juan Montermoso, Ext. 431
Tents and tent-type structures, frame-type and air-supported, and allied equipment	Mr. Conway W. Weikert, Ext. 226
Preservation, packaging and packing, materials and methods	Quartermaster Food and Container Institute 1819 West Pershing Road Chicago, Illinois Telephone: LAfayette 3-5500 Mr. Albert V. Grundy, Ext. 4204 or 4205

Corps of Engineers

Engineering and construction equipment	Engineering Research and Development Laboratories (ERDL) Fort Belvoir, Virginia Telephone: SOuth 5-7700 EDgewater 9-5500 Dr. George W. Howard, Technical Director, Ext. 27233
Advanced energy sources and conversion (other than nuclear) for electric power generation--electrochemical conversion; thermoelectric and thermionic devices; solar wind-power generators	Mr. Earl F. Cogswell, Ext. 34143
Air-conditioning, heating and ventilating equipment and prefabricated buildings	Mr. Raymond Bartelmes, Ext. 7147
Cryogenic equipment, guided missile ground support--LOX generating plant, portable and nonportable; LOX containers; converters; pumps; generator, liquid carbon dioxide; and allied equipment High-pressure air compressors and associated equipment	Mr. John R. Hoffman, Ext. 23232
Fire-fighting equipment; trucks; trailers; pumper, nozzle, water, monitor type; nozzle assembly; foam-making allied equipment	Mr. James Malcolm, Ext. 23200
Portable engine generators--gasoline-engine-driven; compression-ingnition-engine-driven (diesel)	Mr. Donald Looft, Ext. 24240

Corps of Engineers (Continued)

Subject	Contact
Portable engine generators (development)--gasoline-engine-driven; compression-ignition-engine-driven (diesel)	Mr. David Ginsberg, Ext. 34257
Surveying and geodetic equipment	Mr. M. C. Shetler, Ext. 34219

Signal Corps

Communications equipment	U. S. Army Signal Research and Development Laboratory (USASRDL) Fort Monmouth, New Jersey Telephone: LIberty 2-4000 Col. H. McD. Brown, C.O., Ext. 51111
Batteries (primary and secondary), power supplies, converters, rectifiers, etc.	Mr. Arthur F. Daniel, Ext. 51057
Communication security	Mr. Albert P. Brogle, Ext. 51965
Communications equipment and systems	Mr. A. E. Hunt, Ext. 52641
Electron tubes; microwave; receiving tubes	Mr. K. Garoff, Ext. 61486
Electronic components and materials; electronic parts: resistors, capacitors, relays, transformers, switches and allied items	Mr. V. J. Kublin, Ext. 51834
Frequency-control devices; atomic frequency standards; quartz crystals, filters, gas cells, etc.	Dr. E. A. Gerber, Ext. 52250
Loud-speakers, audio-frequency amplifiers, microphones, etc.	Mr. Gordon W. Bartle, Ext. 51366
Meteorology; meteorological research; meteorological equipment	Mr. D. E. Deisinger, Ext. 61224
Public-address equipment; related signaling devices--interphone	Mr. Henry F. Burkhart, Ext. 51241
Radio interference reduction	Mr. J. J. Egli, Ext. 51638
Shelters, transportable, to house meteorological, photographic, radio and electronic equipment	Mr. S. Morford, Ext. 52517
Solid-state devices; germanium and silicon transistors; diodes, etc.	Dr. H. Jacobs, Ext. 51016
Television in guided-missile instrumentation; missile damage assessment	Mr. J. G. Rice, Ext. 51219
Computers and data-processing equipment and crypto devices	Office of the Chief Signal Officer The Pentagon, Washington 25, D. C. Telephone: OXford 53402 Mr. Lester H. Geiger

Chemical Corps

Subject	Contact
Propellants: protective and servicing equipment	U. S. Army Chemical Warfare Laboratories Army Chemical Center Edgewood Arsenal, Maryland Telephone: EDgewood 1000 Col. Donald E. Yanka, Commander Ext. 27120
Air-filtration equipment for chemical, biological and radiological (CBR) protection	Mr. L. A. Jonas, Ext. 5254
Liquid-propellant-servicing equipment, design, development and component testing--transfer, storage, filtration, fume and liquid decontamination and disposal, mobile tankage and refuelers, etc.	Mr. Bruce Hildebrand, Ext. 5133
Propellants, information on health hazards	Dr. Keith H. Jacobson, Ext. 25259
Respiratory protective equipment	Mr. Allan L. West, Ext. 4282

Transportation Corps

Transportation equipment	U. S. Army Transportation Research Command Fort Eustis, Virginia Telephone: TRinity 7-1311 Dr. Joseph de Rende, Director of Research Ext. 7183
Army aviation research	Mr. Larry Hewin Ext. 6184
Land mobility, including rail	Lt. Col. S. D. Williamson, Ext. 6185
Surface transport research and development	Mr. Charles D. Roach Ext. 23175
Supply, maintenance, engineering and procurement of Transportation Corps equipment	Transportation Materiel Command St. Louis, Missouri Telephone: MAin 1-6426 Col. J. W. Koletty, Director of Engineering Ext. 569 Mr. Howard Wilson Ext. 570